

## Safety Module

**Safety Topic:** Osmium tetroxide

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**OsO<sub>4</sub> (CAS 20816-12-0)**



- **Purpose** – Osmium tetroxide (OsO<sub>4</sub>) is a highly toxic compound used most prevalently for the dihydroxylation of alkenes to *syn*-diols. It is commonly supplied as a pale yellow solid in a glass ampule, as a 4 wt % solution in water, or as a 2.5 wt % in *t*-BuOH. The compound has an acrid, “chlorine-like” odor.
- **Toxicity** – OsO<sub>4</sub> is a severe irritant to the eyes, respiratory tract, skin, kidneys, and liver. Exposure to OsO<sub>4</sub> can lead to damage and staining of the cornea and subsequent blindness as OsO<sub>4</sub> can react with the multiple double bonds in retinal. Exposure of volatile OsO<sub>4</sub> to the eyes results in tears, “a gritty feeling in the eyes”, and the appearance of rings around lights. In addition, high levels of exposure can lead to pulmonary edema (fluid accumulation in the lungs), and consequently death. Contact with the skin can cause skin burns, and the appearance of black staining arising from the conversion of OsO<sub>4</sub> to osmium dioxide (OsO<sub>2</sub>). The LD<sub>50</sub> of OsO<sub>4</sub> is 14mg/kg in rats, and 162 mg/kg in mice.
- **Handling** – Due to its high toxicity and volatility, OsO<sub>4</sub> should be handled in a fume hood, with full PPE including a buttoned labcoat with the sleeves rolled down, safety goggles, and double Nitrile gloves. If solid OsO<sub>4</sub> is used, it must be weighed in a fume hood.
- **Storage** – OsO<sub>4</sub> is commonly supplied as a solution, and should be stored in glass under refrigeration, as it can penetrate plastic.
- **Waste handling** – All glassware that has contacted OsO<sub>4</sub> should be decontaminated by rinsing with corn oil (whose double bonds will react with the excess OsO<sub>4</sub>) or sodium sulfite (which will reduce OsO<sub>4</sub> to less toxic forms).
- **For more information see –**
  - E-eros page for OsO<sub>4</sub>  
<https://onlinelibrary.wiley.com/doi/pdf/10.1002/047084289X.ro007.pub3>
  - UCLA SOP  
[https://www.chemistry.ucla.edu/sites/default/files/safety/sop/SOP\\_Osmium\\_Tetroxide.pdf](https://www.chemistry.ucla.edu/sites/default/files/safety/sop/SOP_Osmium_Tetroxide.pdf)